AF/3743

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No. 09/511,292
(Attorney Docket No. H-204325)

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James Nagashima.
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Group 3743

APPARATUS AND METHOD FOR MOUNTING A POWER MODULE

Examiner C. Atkinson

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Commissioner for Patents
PO Box 1450
Alexandria VA 22313-1450

Sir:

BRIEF FOR APPELLANT GENERAL MOTORS

General Motors is filing in triplicate this Brief to support the Appeal of Claims 1-11 which the Final Office Action dated September 15, 2003, finally rejected. Please charge the fee required by this Brief to Deposit Account No. 07-0960.

I. REAL PARTY IN INTEREST

In this appeal the real party of interest is the assignee, General Motors Corporation.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences.

III. STATUS OF CLAIMS

Claims 1-11 are under final rejection and are on appeal.

IV. STATUS OF AMENDMENTS

General Motors has filed no amendments since the final rejection of September 15, 2003.

V. SUMMARY OF INVENTION

Below is a Brief Summary discussing the objective features and advantages of the invention. Following the Brief Summary is a detailed summary complying with 37 C.F.R. 1.192(c)(3).

A. BRIEF SUMMARY

The present invention is a method and apparatus for mounting power modules. In the present invention the power module is mounted over a fluid manifold so that liquid coolants flowing through the manifold come into direct contact with the power modules. The present invention includes a thermally conductive base plate to dissipate excessive heat generated during operation. The baseplate of the power module is sealed to the coolant manifold by a seal to prevent coolant leakage. A consistent force across each edge of the module is maintained by a plurality of connecting elements to ensure that the seal does not leak over its design life and environment.

B. DETAILED SUMMARY

Claim 1 recites a cooling assembly (page 2, lines 14-26 and page 3, lines 9-14; Figure 1 reference number 10); comprising a heat sinking member having a plurality of recesses defined therein (page 4, lines 1-5; Figure 1, reference number 40), said heat sinking member receptive to liquid coolant flow (page 3, lines 18-22); a power module disposed on said heat sinking member (page 3, lines 25-30; Figure 1, reference number 38), said power module having a casing with a plurality of indentations therein, said indentations being positioned relative to said recesses to located said power module on said heat sinking member (page 3, lines 29-30; Figure 1, reference number 32); and a plurality of spring clip pairs 44, each of said spring clips having first and second extensions (page 4, lines 5-10; Figure 1, reference numbers 48 and 50), one of said first and second extensions cooperating with a corresponding one of said recesses and the other one of said first and second extensions corresponding with a corresponding one of said indentations to retain said power module on said heat sinking member and to facilitate heat transfer during operation of said power module (page 4, lines 15-30); and wherein each of said spring clips exerts a substantially equal force to retain said power module on said heat sinking member (page 4, lines 22-30), whereby a substantially liquid proof seal may be formed between said power module and said heat sinking member (page 2, lines 13-26 and page 4, lines 18-22).

Claim 2 recites the cooling assembly of Claim 1, further comprising a sealing member (page 3, lines 18-22; Figure 1, reference number 31).

Claim 3 recites the cooling assembly of Claim 2, wherein the sealing member is a gasket (page 3, lines 18-22; Figure 1, reference number 31).

Claim 4 recites the cooling assembly of Claim 3 [4], wherein [the] said heat sinking member includes a channel defined therein for allowing coolant to flow therethrough (page 3, lines 18-22; Figure 1 reference number 28).

Claim 5 recites the cooling assembly of Claim 4, wherein the heat sinking member includes an opening leading to said channel to allow said power module to directly contact coolant flowing in said channel (page 4, lines 18-22).

Claim 6 recites the cooling assembly of Claim 1 wherein said heat sinking member is an elongated generally rectangular member (page 3, lines 9-25).

Claim 7 recites the cooling assembly of Claim 5, wherein said opening is generally rectangular (page 3, lines 15-28 and page 4, lines 18-22).

Claim 8 recites the cooling assembly of Claim 5, wherein said power module includes a baseplate sealably mounted over said opening (page 4, lines 18-22).

Claim 9 recites the cooling assembly of Claim 1, wherein said spring clips comprise generally C-shaped spring clips (page 4, lines 5-6).

Claim 10 recites a method of assembling a cooling system comprising : locating a power module on a heat sinking member receptive to coolant flow therethrough (page 3, lines 9-30 and Figure 1); and

coupling said power module and the heat sinking member using a plurality of spring clip pairs (page 4, lines 1-18); and

generating a substantially consistent pressure across said power module and the heat sinking member with said plurality of spring clip pairs to form a liquid coolant seal (page 4, lines 15-17).

Claim 11 recites the method of Claim 10 further comprising locating a sealing member between said power module and said heat sinking member (page 4, lines 17-22).

VI. ISSUES

Whether Claims 1-11 are unpatentable over Wolgemuth et al. in view of Larson et al.

VII. GROUPING OF CLAIMS

General Motors groups the claims as follows for this Appeal. Claims 1-3 and 9 comprise a first group, Claim 4 comprises a second group, Claim 5 comprises a third group, Claims 6-8 comprise a fourth group, Claim 10 comprises a fifth group, and Claim 11 comprises a sixth group. Group two includes an apparatus claim and patentably differs from the other groups, as it includes limitations for a coolant channel. Group three patentably differs from the other groups, as it includes limitations for a power module having direct contact with coolant flow. Group five patentably differs from the other groups, as it includes limitations for a liquid proof seal formed between a heat sinking member and a power module. Group six patentably differs from the other groups, as it includes limitations for locating a sealing member between the heat sinking member and power module. Groups one, two, three, four, five, and six do not stand or fall together.

VIII. ARGUMENT

A. THE SCOPE AND CONTENT OF THE PRIOR ART: CLAIM REJECTIONS UNDER 35 U.S.C §103

On page 2 of the Final Office Action of September 15, 2003, the Examiner rejected Claims 1-11 under 35 USC §103 as being unpatentable over Wolgemuth et al. in view of Larson et al. Applicants respectfully disagree with the Examiner. As previously stated by the Examiner in the Final Office Action, Wolgemuth et al does not disclose spring clips, recesses, and indentions. Rather, Wolgemuth et al uses threaded fasteners in a cooling apparatus.

Larson et al. discloses a self contained heat-piping system consisting of an evaporator, cooling tubes, and a condenser unit. As shown in Figures 4-6, the evaporator system 5, is self contained system with and O-ring 32 to contain the liquid and vapor states of the coolant. The clips 52 and 54 merely attach the chip 10 to the evaporator 5, as disclosed in column 7, lines 39-44. The clips 52 and 54 do not form a liquid proof seal, as the liquid is completely self contained in the evaporator 5. Wolgemuth et al. and Larson et al., singly or in combination, do not teach or suggest the present invention.

THE SCOPE AND CONTENT OF THE PRIOR ART

1. Wolgemuth et al.

a. In general, Wolgemuth et al. discloses a heat sink or cold plate, which is cooled with a cooling fluid.

b. Wolgemuth does not teach or suggest the use of spring clips and in fact teaches away from using spring clips.

Wolgemuth et al. uses threaded fasteners 44 to permit the base plate of a power electronics component to be secured to the surface of a cold plate, as disclosed in column 5, lines 1-15. The threaded fasteners require the machining of holes and the sizing of fasteners to attach the power electronics to the cold plate. The spring clips of the present invention are superior in function to screws or other threaded fasteners. Unlike screws or other fasteners, the clips are self-adjusting and will not loosen or back out over time and also mitigate creep.

2. Larson et al.

a. In general, Larson et al discloses a two-phase liquid cooling system in a container structure.

b. Larson does not disclose a liquid proof seal as claimed in the present invention and the suggested combination of Wolgemuth et al and Larson et al. is not taught or suggested by the art.

Larson discloses a self contained heat-piping/heat sink system consisting of an evaporator, cooling tubes, and a condenser unit. As shown in Figures 4-6, the evaporator system 5, is self contained system with and O-ring 32 to contain the liquid and vapor states of the coolant. The clips 52 and 54 merely attach the chip 10 to the evaporator 5, as disclosed in column 7, lines 39-44. The clips 52 and 54 do not form a liquid proof seal, as the liquid is completely **self contained** in the evaporator 5

The Examiner stated in the Final Office Action that Larson et al. in Figures 5-7 discloses sealing a liquid within a heat exchanger via an O-ring and fasteners and having clips exerting a force to retain the electronic device. As discussed previously the clips 52 and 54 **do not form a liquid proof seal**, as the fasteners that are used to form the liquid proof seal are screws 40 or an epoxy cement, as disclosed in column 7, lines 10-15. The clips 52 and 54 are merely an attachment mechanism for the completely sealed evaporator to attach to the chip 10. Larson et al. does not teach or suggest the use of clips to form a liquid proof seal or the attachment of a sealing member between said power module and said heat sinking member, as the evaporator 5 of Larson et al. is a completely self contained unit. Accordingly, the combination suggested by the Examiner does not teach or suggest the present invention, and there would be no motivation to combine Wolgemuth et al. and Larson et al. Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching suggestion or incentive supporting the combination. *ACS Hospital Systems, Inc. v. Monteffore Hospital*, 732 F.2d 1572, 1577.

A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of the invention to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of hindsight syndrome wherein that which only the invention taught is used against its teacher. *In Re Kotzab*, 217 F.3d 1365. The Examiner has fallen victim to hindsight reconstruction and has also ignored the elements of the claimed invention and failed to explain how and why the claimed subject matter is rendered unpatentable over the prior art and point out where each of the specific limitations recited in the rejected claims is found in the prior art.

3. Wolgemuth et al. and Larson et al.

a. The suggested combination of Wolgemuth et al. and Larson et al. by the Examiner is improper.

Wolgemuth et al. specifically teaches away from using clips and recesses, as it requires the drilling of threaded holes and the use of threaded fasteners. The suggested combination of the Examiner is improper, references cannot be combined where the reference teaches away from their combination. See MPEP Section 2145. In establishing a prima facie case of obviousness, the Examiner must establish that: there is a suggestion or motivation in the art to combine the references; there is a reasonable expectation of success; and the prior art references must teach or reference all the claim limitations. The prior art cited by the Examiner, singly or in combination does not teach or suggest the present invention and in fact teaches away from the present claimed invention.

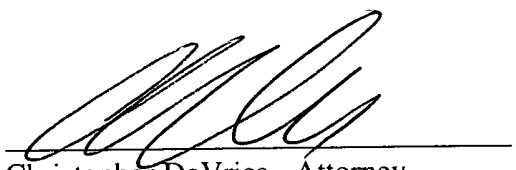
b. The combination of Wolgemuth et al. and Larson et al. is inoperable.

Wolgemuth et al. teaches away from using clips to attach a heat sink to power electronics. There is no suitable mechanical interface in Wolgemuth et al. for the clips of Larson et al., as there are only threaded holes in Wolgemuth et al. The structure and threaded holes of the Wolgemuth system do not have the capability to accept any types of clips. An attempt to combine Wolgemuth et al. and Larson et al. would generate a nonfunctioning control system.

SUMMARY

Wolgemuth et al. and Larson et al., singly or in combination, do not teach or suggest the present claimed invention. Furthermore, the combination suggested by the Examiner of Wolgemuth et al. and Larson et al. is improper and would be inoperable. The Examiner has failed to explain how and why the claimed subject matter is rendered unpatentable over the prior art and point out where each of the specific limitations recited in the rejected claims is found in the prior art relied on. Applicants therefore request allowance of independent Claims 1-11.

Respectfully submitted,



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Appendix A

1. (previously presented) A cooling assembly comprising:

a heat sinking member having a plurality of recesses defined therein; said heat sinking member receptive to liquid coolant flow;

a power module disposed on said heat sinking member, said power module having a casing with a plurality of indentations therein, said indentations being positioned relative to said recesses to located said power module on said heat sinking member; [and]

a plurality of spring clip pairs, each of said spring clips having first and second extensions, one of said first and second extensions cooperating with a corresponding one of said recesses and the other one of said first and second extensions corresponding with a corresponding one of said indentations to retains said power module on said heat sinking member and to facilitate heat transfer during operation of said power module;

and wherein each of said spring clips exerts a substantially equal force to retain said power module on said heat sinking member, whereby a substantially liquid proof seal may be formed between said power module and said heat sinking member.

2.(original) The cooling assembly of claim 1, further comprising a sealing member.

3. (original) The cooling assembly of claim 2, wherein the sealing member is a gasket.

4. (original) The cooling assembly of claim 3 [4], wherein [the] said heat sinking member includes a channel defined therein for allowing coolant to flow therethrough.

5. (original) The cooling assembly of claim 4, wherein the heat sinking member includes an opening leading to said channel to allow said power module to directly contact coolant flowing in said channel.

6. (original) The cooling assembly of claim 1 wherein said heat sinking member is an elongated generally rectangular member.

7. (original) The cooling assembly of claim 5, wherein said opening is generally rectangular.

8. (original) The cooling assembly of claim 5, wherein said opening is generally rectangular.

9. (original) The cooling assembly of claim 1, wherein said spring clips comprise generally C-shaped spring clips.

10. (previously presented) A method of assembling a cooling system comprising: locating a power module on a heat sinking member receptive to coolant flow therethrough; and

coupling said power module and the heat sinking member using a plurality of spring clip pairs; and

generating a substantially consistent pressure across said power module and the heat sinking member with said plurality of spring clip pairs to form a liquid coolant seal.

11. The method of assembly of claim 10 further comprising locating a sealing member between said power module and said heat sinking member.